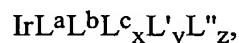


CLAIMS

What is claimed is:

1. An organic electronic device comprising an emitting layer wherein at least 20% by weight of the emitting layer comprises at least one compound having
5 a formula below:



where:

$x = 0$ or 1 , $y = 0$, 1 or 2 , and $z = 0$ or 1 , with the proviso that:

$x = 0$ or $y + z = 0$ and

10 when $y = 2$ then $z = 0$;

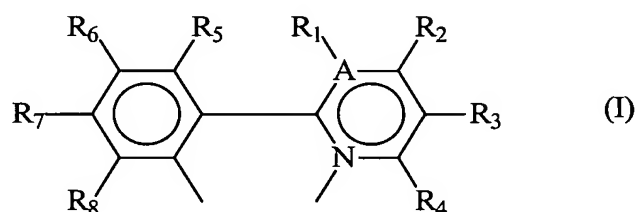
L' = a bidentate ligand or a monodentate ligand, and is not a phenylpyridine, phenylpyrimidine, or phenylquinoline; with the proviso that:

when L' is a monodentate ligand, $y + z = 2$, and

15 when L' is a bidentate ligand, $z = 0$;

L'' = a monodentate ligand, and is not a phenylpyridine, and phenylpyrimidine, or phenylquinoline; and

20 L^a , L^b and L^c are alike or different from each other and each of L^a , L^b and L^c has structure (I) below:



wherein:

25 adjacent pairs of R_1 - R_4 and R_5 - R_8 can be joined to form a five- or six-membered ring,

at least one of R_1 - R_8 is selected from F , $\text{C}_n\text{F}_{2n+1}$,

$\text{OC}_n\text{F}_{2n+1}$, and OCF_2X , where $n = 1$ -6 and $\text{X} = \text{H}$, Cl , or Br , and

$\text{A} = \text{C}$ or N , provided that when $\text{A} = \text{N}$, there is no R_1 .

30 2. The device of Claim 1 wherein $x = 1$, $y = 0$, and $z = 0$.

3. The device of Claim 2 wherein $\text{A} = \text{C}$ and none of R_1 - R_8 is selected from nitro.

4. The device of Claim 1 wherein R_3 is CF_3 .

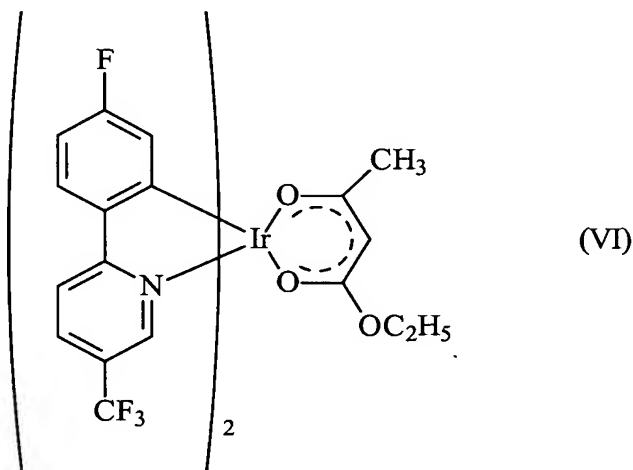
5. The device of Claim 4 wherein at least one of R_5 - R_8 is selected from F, C_nF_{2n+1} , OC_nF_{2n+1} , and OCF_2X , where $n = 1-6$ and $X = H, Cl, \text{ or } Br$.

6. The device of Claim 2 wherein $A = C$, $R_3 = CF_3$, $R_7 = F$, and R_1, R_2, R_4 - R_6 and $R_8 = H$.

7. The device of Claim 2 wherein $A = C$, R_3 and $R_6 = CF_3$, and R_1, R_2, R_4, R_5, R_7 and $R_8 = H$.

8. The device of Claim 2 wherein $A = C$, $R_3 = CF_3$, R_6 and $R_8 = F$, and R_1, R_2, R_4, R_5 , and $R_7 = H$.

9. The device of Claim 1 wherein $x = 0$ and $y = 1$ having a structure (VI) below:

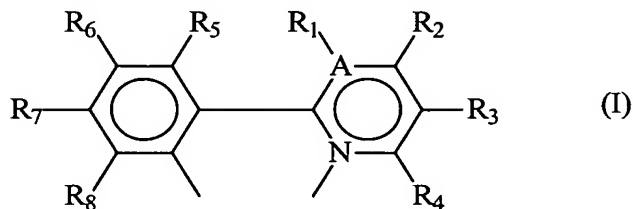


10. An organic electronic device comprising an emitting layer wherein the emitting layer comprises a diluent and less than 20% by weight of at least one compound that has a formula below:



where:

L^a , L^b and L^c are alike or different from each other and each of L^a , L^b and L^c has structure (I) below:



wherein:

adjacent pairs of R_1 - R_4 and R_5 - R_8 can be joined to form a five- or six-membered ring,

at least one of R_1 - R_8 is selected from F, C_nF_{2n+1} ,

5 OC_nF_{2n+1} , and OCF_2X , where $n = 1-6$ and $X = H, Cl, \text{ or } Br$, and $A = C \text{ or } N$, provided that when $A = N$, there is no R_1 .

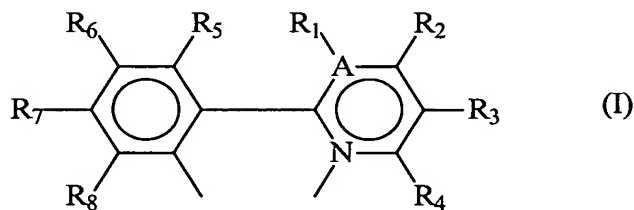
11. The device of Claim 10 wherein the diluent is selected from poly(N-vinyl carbazole), polysilane, 4,4'-N,N'-dicarbazole biphenyl, and tertiary aromatic amines.

10 12. The device of Claim 1, further comprising a hole transport layer selected from N,N'-diphenyl-N,N'-bis(3-methylphenyl)-[1,1'-biphenyl]-4,4'-diamine (TPD), 1,1-bis[(di-4-tolylamino) phenyl]cyclohexane (TAPC), N,N'-bis(4-methylphenyl)-N,N'-bis(4-ethylphenyl)-[1,1'-(3,3'-dimethyl)biphenyl]-4,4'-diamine (ETPD), tetrakis-(3-methylphenyl)-N,N,N',N'-2,5-phenylenediamine (PDA), α -phenyl-4-N,N'-diphenylaminostyrene (TPS), p-(diethylamino)-benzaldehyde diphenylhydrazone (DEH), triphenylamine (TPA), bis[4-(N,N-diethylamino)-2-methylphenyl](4-methylphenyl)methane (MPMP), 1-phenyl-3-[p-(diethylamino)styryl]-5-[p-(diethylamino)phenyl] pyrazoline (PPR or DEASP), 1,2-trans-bis(9H-carbazol-9-yl)cyclobutane (DCZB), N,N,N',N'-tetrakis(4-methylphenyl)-(1,1'-biphenyl)-4,4'-diamine (TTB), porphyrinic compounds, and combinations thereof.

13. The device of Claim 1, further comprising an electron transport layer selected from tris(8-hydroxyquinolato)aluminum, 2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline (DDPA), 4,7-diphenyl-1,10-phenanthroline (DPA), 2-(4-biphenyl)-5-(4-t-butylphenyl)-1,3,4-oxadiazole (PBD), 3-(4-biphenyl)-4-phenyl-5-(4-t-butylphenyl)-1,2,4-triazole (TAZ), and combinations thereof.

14. A compound having a formula selected from *fac*-Ir(L)₃, *mer*-Ir(L)₃, and combinations thereof, where L is selected from group 1-a through 1-m and 1-q through 1-v, as shown in Table 1, and has structure (I) below:

30



wherein:

adjacent pairs of R_1 - R_4 and R_5 - R_8 can be joined to form a five- or six-membered ring,

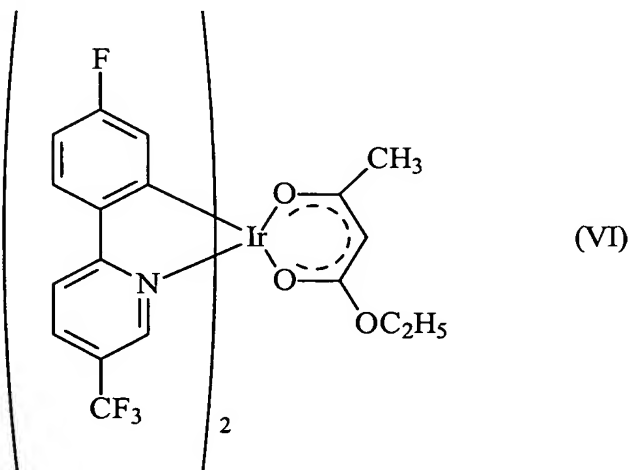
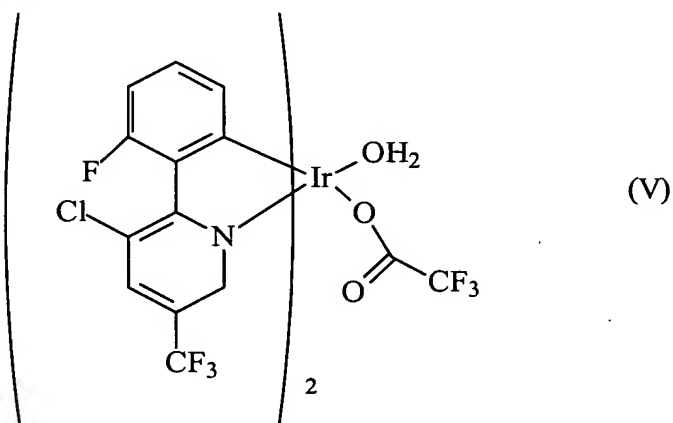
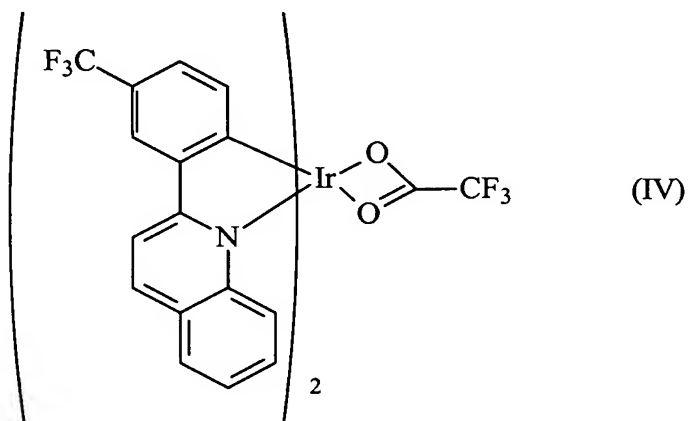
at least one of R_1 - R_8 is selected from F , C_nF_{2n+1} ,

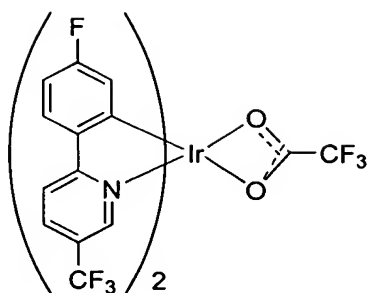
OC_nF_{2n+1} , and OCF_2X , where $n = 1-6$ and $X = H, Cl, \text{ or } Br$, and

$A = C \text{ or } N$, provided that when $A = N$, there is no R_1 .

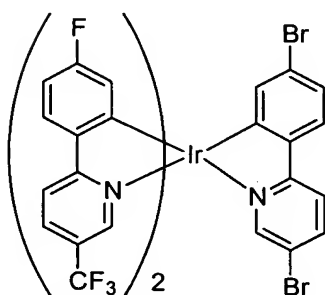
5

15. A compound having a structure selected from structures (IV), (V), (VI), (IX) and (X) below:





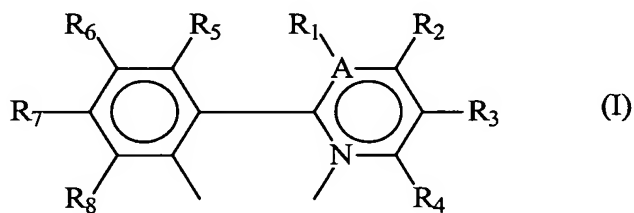
(IX)



(X)

16. An organic electronic device comprising an emitting layer that comprises a compound selected from the following (i) and (ii):

(i) a compound having a formula selected from $fac\text{-Ir(L)}_3$, $mer\text{-Ir(L)}_3$, and combinations thereof, where L is a group selected from 1-a through 1-m and 1-q through 1-v, as shown in Table 1 and has structure (I) below:



wherein:

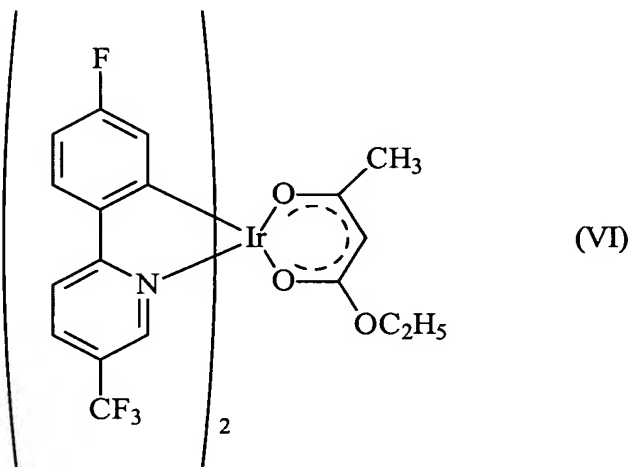
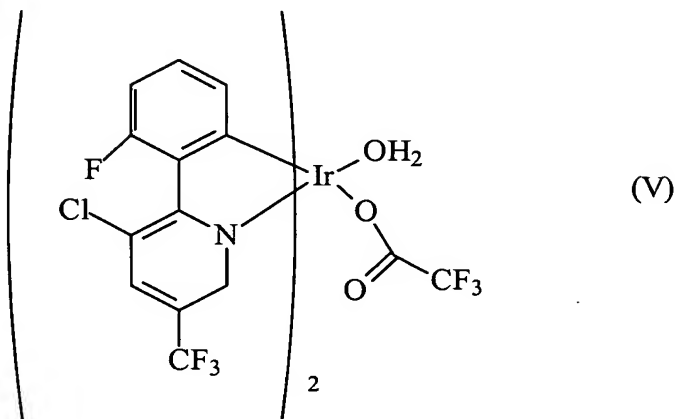
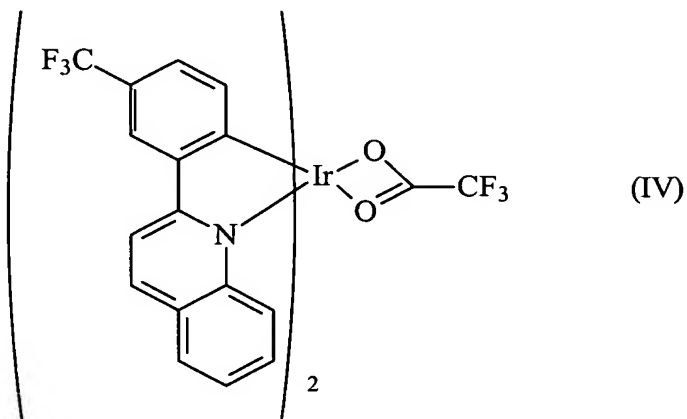
adjacent pairs of $R_1\text{-}R_4$ and $R_5\text{-}R_8$ can be joined to form a five- or six-membered ring,

at least one of $R_1\text{-}R_8$ is selected from F, C_nF_{2n+1} , OC_nF_{2n+1} , and OCF_2X , where $n = 1\text{-}6$ and $X = H, Cl, \text{ or } Br$, and

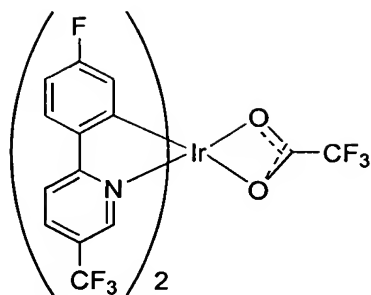
- A = C or N, provided that when A = N, there is no R₁;
(ii) a compound having one of structures (IV), (V), (VI), (IX), and (X)

below:

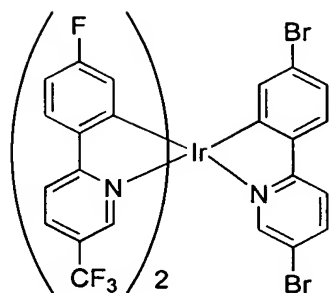
5



10



(IX)



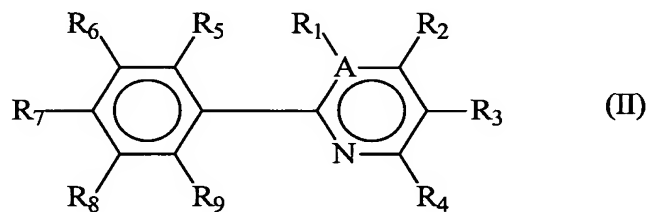
(X)

5

17. The device of Claim 16 wherein the emitting layer further comprises a diluent.

10 18. The device of Claim 17 wherein the diluent is selected from poly(N-vinyl carbazole), polysilane, 4,4'-N,N'-dicarbazole biphenyl, and tertiary aromatic amines.

19. A compound selected from compounds 2-a through 2-aa as shown in Table 2, having structure (II) below:



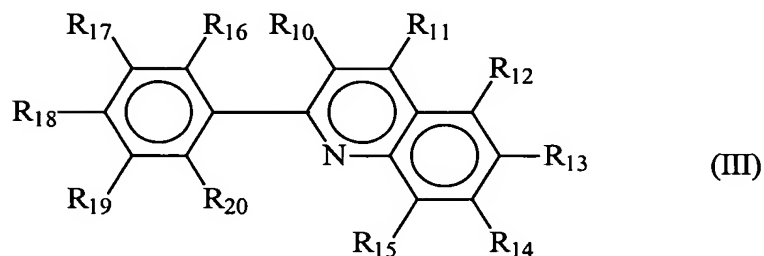
15

wherein: R_9 is H;
adjacent pairs of R_1 - R_4 and R_5 - R_8 can be joined to form a five- or six-membered ring;

at least one of R_1 - R_8 is selected from F , C_nF_{2n+1} ,
 OC_nF_{2n+1} , and OCF_2X , where $n = 1-6$ and $X = H, Cl, \text{ or } Br$, and
 $A = C \text{ or } N$, provided that when $A = N$, there is no R_1 .

20. A compound having structure (III) below:

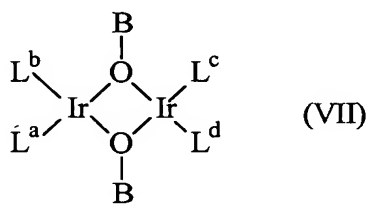
5



wherein $R_{17} = CF_3$ and R_{10} - R_{16} and R_{18} - $R_{20} = H$.

10

21. A compound having structure VII below:

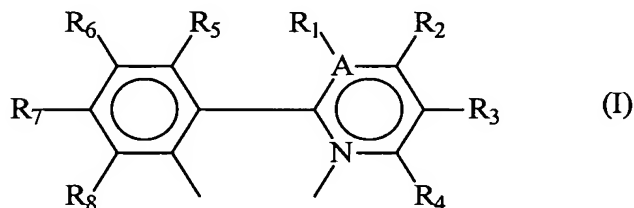


wherein:

$B = H, CH_3, \text{ or } C_2H_5$;

15

$L^a, L^b, L^c, \text{ and } L^d$ are the same or different from each other; and
each of $L^a, L^b, L^c, \text{ and } L^d$ has structure (I) below:



20

wherein:

adjacent pairs of R_1 - R_4 and R_5 - R_8 can be joined to form a
five- or six-membered ring,

at least one of R_1 - R_8 is selected from F , C_nF_{2n+1} ,
 OC_nF_{2n+1} , and OCF_2X , where $n = 1-6$ and $X = H, Cl, \text{ or } Br$, and
 $A = C \text{ or } N$, provided that when $A = N$, there is no R_1 .

25

22. The compound of Claim 21 wherein:

$$L^a = L^b = L^c = L^d;$$

$$B = H;$$

$$R_3 = CF_3;$$

$$R_7 = F;$$

$$R_1, R_2, R_4-R_6 \text{ and } R_8 = H.$$

5